

**1.**

0,9. 0,85. 0,5

$$\tilde{p}_1 = 0,85, \tilde{p}_2 = 0,9 -$$

$$p = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 = 0,5 \cdot 0,85 + 0,5 \cdot 0,9 = 0,425 + 0,45 = 0,875 -$$

: 0,875

**2.**

80% -20%. 0,1, -0,4.

$$p_1 = 0,8, p_2 = 0,2 -$$

$$\tilde{p}_1 = 1 - 0,1 = 0,9, \tilde{p}_2 = 1 - 0,4 = 0,6 -$$

$$p = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 = 0,8 \cdot 0,9 + 0,2 \cdot 0,6 = 0,72 + 0,12 = 0,84 -$$

: 0,84

**3.**

$$p_1 = p_2 = p_3 = \frac{1}{3}$$

$$\tilde{p}_1 = \frac{4}{9}, \tilde{p}_2 = \frac{5}{9}, \tilde{p}_3 = \frac{6}{6} = 1 -$$

$$p = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 + p_3 \tilde{p}_3 = \frac{1}{3} \cdot \frac{4}{9} + \frac{1}{3} \cdot \frac{5}{9} + \frac{1}{3} \cdot 1 = \frac{4}{27} + \frac{5}{27} + \frac{1}{3} = \frac{1}{3} + \frac{1}{3} = \frac{2}{3}$$

$$p_2 = \frac{p_2 \tilde{p}_2}{p} = \frac{5}{27} \cdot \frac{3}{2} = \frac{5}{18}$$

$$: ) \frac{2}{3} \approx 0,6667 \quad ) \frac{5}{18} \approx 0,2778$$

**4.**

$$p = \frac{1}{10} \cdot \frac{1}{2} + \frac{1}{10} \cdot \frac{1}{2} + \dots + \frac{1}{10} \cdot \frac{1}{2} + \frac{1}{10} \cdot \frac{5}{6} = \frac{9}{20} + \frac{1}{12} = \frac{8}{15}$$

$$p_{10} = \frac{1}{15} = \frac{12}{12} \cdot \frac{15}{8} = \frac{5}{32} = 0,15625$$

$$: 0,15625$$

5.

0,7; 0,2 – 0,8  
0,3.

$$\begin{aligned} p_1 &= 0,8 - \\ p_2 &= 0,2 - \\ \tilde{p}_1 &= 0,7 - \\ \tilde{p}_2 &= 0,3 - \end{aligned}$$

$$p = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 = 0,8 \cdot 0,7 + 0,2 \cdot 0,3 = 0,56 + 0,06 = 0,62$$

$$p_1^* = \frac{p_1 \tilde{p}_1}{p} = \frac{0,56}{0,62} = \frac{28}{31}$$

$$\therefore \frac{28}{31} \approx 0,9032$$

6.

100 98 100, 4 0,02.

$$p = 0,02$$

$$q = 1 - p = 1 - 0,02 = 0,98$$

$$\begin{aligned} p_+ &= 0,98 - \\ \bar{p}_+ &= 0,04 - \end{aligned}$$

$$p = p \cdot p_+ + q \cdot \bar{p}_+ = 0,02 \cdot 0,98 + 0,98 \cdot 0,04 = 0,0196 + 0,0392 = 0,0588$$

$$\tilde{p} = \frac{p \cdot p_+}{p} = \frac{0,0196}{0,0588} = \frac{1}{3}$$

$$\therefore \tilde{p} = \frac{1}{3}$$

**7.**

1 0,03, 2 - 0,02.  
 , 2. , 1, , ,  
 ; )

: x - , 2,  
 1: 2x

$$2x + x = 1$$

$$3x = 1$$

$$x = \frac{1}{3}$$

$$p_1 = \frac{2}{3}, p_2 = \frac{1}{3} -$$

$$\tilde{p}_1 = 1 - \frac{3}{100} = \frac{97}{100}, \tilde{p}_2 = 1 - \frac{2}{100} = \frac{98}{100} -$$

$$p = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 = \frac{2}{3} \cdot \frac{97}{100} + \frac{1}{3} \cdot \frac{98}{100} = \frac{194}{300} + \frac{98}{300} = \frac{292}{300} = \frac{73}{75} -$$

$$p_1^* = \frac{p_1 \tilde{p}_1}{p} = \frac{194}{300} \cdot \frac{75}{73} = \frac{97}{146} -$$

$$: ) \frac{73}{75} \approx 0,973 \quad ) \frac{97}{146} \approx 0,664$$

**8.**

20 : ,6 -0,9, 4 . -0,8,  
 -0,75. , )

$$: : 20 + 6 + 4 = 30$$

$$p_1 = \frac{20}{30} = \frac{2}{3}, p_2 = \frac{6}{30} = \frac{1}{5}, p_3 = \frac{4}{30} = \frac{2}{15} -$$

$$\tilde{p}_1 = 0,9 = \frac{9}{10}, \tilde{p}_2 = 0,8 = \frac{4}{5}, \tilde{p}_3 = 0,75 = \frac{3}{4} -$$

$$p = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 + p_3 \tilde{p}_3 = \frac{2}{3} \cdot \frac{9}{10} + \frac{1}{5} \cdot \frac{4}{5} + \frac{2}{15} \cdot \frac{3}{4} = \frac{3}{5} + \frac{4}{25} + \frac{1}{10} = \frac{43}{50} = 0,86$$

$$q = 1 - p = 1 - 0,86 = 0,14$$

$$p = 0,86 \quad q = 0,14$$

9. 2500, 3000, 1500, 1, 90%  
 2 - 80%, 3 - 70%.

$$: 1500 + 2500 + 3000 = 7000$$

$$p_1 = \frac{1500}{7000} = \frac{3}{14}, p_2 = \frac{2500}{7000} = \frac{5}{14}, p_3 = \frac{3000}{7000} = \frac{6}{14}$$

$$\tilde{p}_1 = \frac{9}{10}, \tilde{p}_2 = \frac{8}{10}, \tilde{p}_3 = \frac{7}{10}$$

$A$  -  
 $\bar{A}$  -

$$P(A) = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 + p_3 \tilde{p}_3 = \frac{3}{14} \cdot \frac{9}{10} + \frac{5}{14} \cdot \frac{8}{10} + \frac{6}{14} \cdot \frac{7}{10} = \frac{27}{140} + \frac{40}{140} + \frac{42}{140} = \frac{109}{140}$$

$$P(A) + P(\bar{A}) = 1,$$

$$P(\bar{A}) = 1 - P(A) = 1 - \frac{109}{140} = \frac{31}{140}$$

$$P(\bar{A}) = \frac{31}{140} \approx 0,22, \quad P(A) = \frac{109}{140} \approx 0,78$$

**10.**

3

3:4:5,  
0,04; 0,05; 0,03.

3-

$$3 + 4 + 5 = 12.$$

$$: p_1 = \frac{3}{12}, p_2 = \frac{4}{12}, p_3 = \frac{5}{12} -$$

2- 3-

$$: \tilde{p}_1 = \frac{4}{100}, \tilde{p}_2 = \frac{5}{100}, \tilde{p}_3 = \frac{3}{100} -$$

$$p = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 + p_3 \tilde{p}_3 = \frac{3}{12} \cdot \frac{4}{100} + \frac{4}{12} \cdot \frac{5}{100} + \frac{5}{12} \cdot \frac{3}{100} =$$

$$= \frac{12}{1200} + \frac{20}{1200} + \frac{15}{1200} = \frac{47}{1200} -$$

$$p_3^* = \frac{p_3 \tilde{p}_3}{p} = \frac{15}{1200} \cdot \frac{1200}{47} = \frac{15}{47} \approx 0,32 -$$

$$: \frac{15}{47} \approx 0,32$$

**11.**

- 10%, - 14%.

2  
6%,

: x -

:  $3x, \frac{3}{2}x$ .

$$3x + \frac{3}{2}x + x = 1$$

$$\frac{11}{2}x = 1$$

$$x = \frac{2}{11}$$

$$: p_1 = \frac{6}{11}, p_2 = \frac{3}{11}, p_3 = \frac{2}{11} -$$

$$\tilde{p}_1 = \frac{100-6}{100} = 0,94, \tilde{p}_2 = \frac{100-10}{100} = 0,9, \tilde{p}_3 = \frac{100-14}{100} = 0,86.$$

$$p = p_1\tilde{p}_1 + p_2\tilde{p}_2 + p_3\tilde{p}_3 = \frac{6}{11} \cdot 0,94 + \frac{3}{11} \cdot 0,9 + \frac{2}{11} \cdot 0,86 \approx 0,915 -$$

$$: p \approx 0,915$$

**12.**

: ( ), ( ), ( , 30% ).  
 , 50% - , 20% - . , 0,01;  
 0,03, - 0,1.

?

$$: p_1 = 0,3, p_2 = 0,5, p_3 = 0,2 -$$

$$\tilde{p}_1 = 0,01, \tilde{p}_2 = 0,03, \tilde{p}_3 = 0,1 -$$

$$p = p_1\tilde{p}_1 + p_2\tilde{p}_2 + p_3\tilde{p}_3 = 0,3 \cdot 0,01 + 0,5 \cdot 0,03 + 0,2 \cdot 0,1 = 0,003 + 0,015 + 0,02 = 0,038 -$$

$$p_A = \frac{p_1\tilde{p}_1}{p} = \frac{0,003}{0,038} = \frac{3}{38} \approx 0,08 -$$

$$: \frac{3}{38} \approx 0,08$$

**13.** 2500 , - 3000 . 3 : - 1500 , -  
 10%, - 8%, - 5%.  
 ) , ) , )  
 : : 1500 + 2500 + 3000 = 7000 .

$$p_1 = \frac{1500}{7000} = \frac{3}{14}, p_2 = \frac{2500}{7000} = \frac{5}{14}, p_3 = \frac{3000}{7000} = \frac{6}{14}$$

$$\tilde{p}_1 = \frac{10}{100}, \tilde{p}_2 = \frac{8}{100}, \tilde{p}_3 = \frac{5}{100}$$

$$p = p_1\tilde{p}_1 + p_2\tilde{p}_2 + p_3\tilde{p}_3 = \frac{3}{14} \cdot \frac{10}{100} + \frac{5}{14} \cdot \frac{8}{100} + \frac{6}{14} \cdot \frac{5}{100} = \frac{30}{1400} + \frac{40}{1400} + \frac{30}{1400} = \frac{100}{1400} = \frac{1}{14}$$

$$p_1^* = \frac{p_1\tilde{p}_1}{p} = \frac{30}{1400} \cdot 14 = \frac{3}{10} = 0,3$$

$$p_2^* = \frac{p_2\tilde{p}_2}{p} = \frac{40}{1400} \cdot 14 = \frac{2}{5} = 0,4$$

$$p_3^* = \frac{p_3\tilde{p}_3}{p} = \frac{30}{1400} \cdot 14 = \frac{3}{10} = 0,3$$

: ) 0,3      ) 0,4      ) 0,3

**14.** 35, 40% , , 5,4 2%. 25,  
 ) , .  
 ) , ? ,

$$p_1 = 0,25, p_2 = 0,35, p_3 = 0,4$$

$$\tilde{p}_1 = 0,05, \tilde{p}_2 = 0,04, \tilde{p}_3 = 0,02$$



$$p = p_1\tilde{p}_1 + p_2\tilde{p}_2 + p_3\tilde{p}_3 = 0,25 \cdot 0,05 + 0,35 \cdot 0,04 + 0,4 \cdot 0,02 = 0,0125 + 0,014 + 0,008 = 0,0345$$

$$p_1^* = \frac{p_1\tilde{p}_1}{p} = \frac{0,0125}{0,0345} = \frac{25}{69}$$

1-

$$p_2^* = \frac{p_2\tilde{p}_2}{p} = \frac{0,014}{0,0345} = \frac{28}{69}$$

2-

$$p_3^* = \frac{p_3\tilde{p}_3}{p} = \frac{0,008}{0,0345} = \frac{16}{69}$$

3-

$$\frac{25}{69} \approx 0,36, \frac{28}{69} \approx 0,41, \frac{16}{69} \approx 0,23$$

**15.**

$$C_{30}^2 = \frac{30!}{28! \cdot 2!} = \frac{29 \cdot 30}{2} = 435$$

$$C_{25}^2 = \frac{25!}{23! \cdot 2!} = \frac{24 \cdot 25}{2} = 300$$

$$p_1 = \frac{5}{25} = \frac{1}{5}, p_2 = \frac{12}{25}, p_3 = \frac{5}{25} = \frac{1}{5}, p_4 = \frac{3}{25}$$

$$\tilde{p}_1 = \frac{C_{30}^2}{C_{30}^2} = 1$$

$$\tilde{p}_2 = \frac{C_{25}^2}{C_{30}^2} = \frac{300}{435} = \frac{20}{29}$$

$$C_{15}^2 = \frac{15!}{13! \cdot 2!} = \frac{14 \cdot 15}{2} = 105 \quad 2 \quad ,$$

$$\tilde{p}_3 = \frac{C_{15}^2}{C_{30}^2} = \frac{105}{435} = \frac{7}{29} - ,$$

$$C_{10}^2 = \frac{10!}{8! \cdot 2!} = \frac{9 \cdot 10}{2} = 45 \quad 2 \quad ,$$

$$\tilde{p}_4 = \frac{C_{10}^2}{C_{30}^2} = \frac{45}{435} = \frac{3}{29} - ,$$

$$p = p_1 \tilde{p}_1 + p_2 \tilde{p}_2 + p_3 \tilde{p}_3 + p_4 \tilde{p}_4 = \frac{1}{5} \cdot 1 + \frac{12}{25} \cdot \frac{20}{29} + \frac{1}{5} \cdot \frac{7}{29} + \frac{3}{25} \cdot \frac{3}{29} =$$

$$= \frac{1}{5} + \frac{48}{145} + \frac{7}{145} + \frac{9}{725} = \frac{429}{725} - ,$$

$$p_4^* = \frac{p_4 \tilde{p}_4}{p} = \frac{9}{725} \cdot \frac{725}{429} = \frac{3}{143} - ,$$

$$: \frac{3}{143} \approx 0,021$$